COSEWIC
Assessment and Status Report

on the

Banded Cord-moss
Entosthodon fascicularis

in Canada

SPECIAL CONCERN
2005

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

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COSEWIC would like to acknowledge Terry T. McIntosh for writing the status report on the banded cord-moss *Entosthodon fascicularis* prepared under contract with Environment Canada, overseen and edited by René Belland, Co-chair (Mosses and Lichens), COSEWIC Plants and Lichens Subcommittee.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur l'entosthodon fasciculé (*Entosthodon fascicularis*) au Canada.

Cover illustration:
Banded Cord-moss — Photo by Christian Engelstoft, taken February 26, 2005 on Bear Hill, Central Saanich, north of Victoria BC. Patch of the banded cord-moss showing young sporophytes and calyptrae with long tips covering maturing capsules (~ x 15). Habitat: on bare soil amidst grasses and other mosses around an exposed rock knob in a Garry oak opening.

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COSEWIC
Assessment Summary

Assessment Summary – May 2005

Common name
Banded Cord-moss

Scientific name
Entosthodon fascicularis

Status
Special Concern

Reason for designation
This rare species is endemic to western North America. Almost all Canadian populations of this moss occur in the threatened Garry Oak habitat of southwestern British Columbia. Should habitat destruction continue at the present rate, the species will become increasingly vulnerable.

Occurrence
British Columbia

Status history
Designated Special Concern in May 2005. Assessment based on a new status report.

COSEWIC
Executive Summary

Banded Cord-moss
Entosthodon fascicularis

Species information

Entosthodon fascicularis belongs to the moss family Funariaceae, characterized by small species with a great degree of vegetative similarity. There are twelve species of *Entosthodon* in North America, of which only 2 are found in Canada. *Entosthodon fascicularis* grows in small patches on seasonally wet soil. In habitat, it is inconspicuous and often hidden among other mosses and litter. Sporophytes are common.

Distribution

Entosthodon fascicularis has a western North American–western Eurasian disjunctive pattern. It is relatively rare in North America, found only in British Columbia, Washington, Idaho, and Oregon. In Canada, the banded cord-moss is mainly found in a small area in the southwestern coastal area of British Columbia. Only two of the reported populations were located during initial fieldwork for this report.

Habitat

Entosthodon fascicularis usually grows on soil, sometimes in leaf litter with other mosses, and around the bases of vascular plants. The habitats where it is found are open to semi-shaded with seasonally moist areas and rock outcroppings. Ownership of some of the reported populations is undetermined while others are in municipal or provincial parks.

Biology

Entosthodon fascicularis is a small, acrocarpous moss that grows in patches on seasonally wet soil among other mosses and vascular plants. The production of sporophytes is common in Canadian populations and spores are probably of importance in the short-range dispersal of this species. Many small buds are found on underground stems.

Population sizes and trends

At all of the known sites, *Entosthodon fascicularis* is uncommon and the species is represented by a few small patches.

Limiting factors and threats

Limiting factors and threats to *Entosthodon fascicularis* include urban or highway development, hiking, wildfowl grazing, and usage of areas by dogs. A further threat may be long periods of drought and climate change.

Special significance of the species

The British Columbia populations represent the northern extension of its very restricted range in North America. This species is often found in nationally rare and threatened habitats. Most of the North American populations for this species are in Canada.

Existing protection and other status designations

No legislation, regulations, customs, or conditions currently protect this species. In British Columbia, it is listed as apparently secure to secure globally and it is Red-listed provincially.

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the Species at Risk Act (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The Committee meets to consider status reports on candidate species.

DEFINITIONS
(november 2004)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and it is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.
** Formerly described as "Not In Any Category", or "No Designation Required."
*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994.

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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Banded Cord-moss

Entosthodon fascicularis

in Canada

2005

TABLE OF CONTENTS

SPECIES INFORMATION 3
Name and classification 3
Description 3
DISTRIBUTION 5
Global range 5
Canadian range 6
HABITAT 8
Habitat requirements 8
Trends 8
Protection/ownership 8
BIOLOGY 9
General 9
Reproduction and dispersal 9
POPULATION SIZES AND TRENDS 9
LIMITING FACTORS AND THREATS 9
SPECIAL SIGNIFICANCE OF THE SPECIES 10
EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS 11
SUMMARY OF STATUS REPORT 11
TECHNICAL SUMMARY 12
ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED 14
INFORMATION SOURCES 14
BIOGRAPHICAL SUMMARY OF REPORT WRITER 15
COLLECTIONS EXAMINED 15

List of figures

Figure 1. Comparison of *Entosthodon fascicularis* and *E. rubiginosus* 4
Figure 2. North American distribution of *Entosthodon fascicularis* 5
Figure 3. Canadian distribution of *Entosthodon fascicularis* 6

List of tables

Table 1. Population Information for *Entosthodon fascicularis* 7
Table 2. Habitat and General Characteristics of Known Populations of *Entosthodon fascicularis* in British Columbia 10

List of appendices

Appendix 1. Record of work 20

SPECIES INFORMATION

Name and classification

Scientific name:	*Entosthodon fascicularis* (Hedw.) C. Müll.
Pertinent synonyms:	*Funaria leibergii* Britt., *Funaria fascicularis* (Hedw.) Lindb.
Common name:	Banded Cord-moss
Family:	Funariaceae
Major plant group:	Mosses (Musci)

The Funariaceae is a large moss family characterized by species with a great degree of vegetative similarity, with most taxa having broad, light green leaves and large, pale leaf cells (Crum and Anderson 1980). Most species are considered to be short-lived, either annual or biennial (Grout 1935, Lawton 1971). Genera within the family are distinguished by differences in the sporophyte: by the shape, size, and straightness of the capsule, and by the presence, absence, or degree of development of the peristome, a fringe of tooth-like appendages surrounding the mouth of the capsule.

The genus *Entosthodon* consists of diminutive plants that have derived their name from the peristome which, when present, is inserted well inside the mouth of the capsule. *Entosthodon* has shortly exerted, erect, symmetrical, and operculate capsules with moderately large spores. Members of this genus tend to colonize ephemeral habitats that are repeatedly, but inconsistently, available in the same area, rather than depending on wind dispersal of spores to reach more widely distributed suitable areas.

There are twelve species of *Entosthodon* in North America, with only *E. fascicularis* and *E. rubiginosus* found in Canada, both restricted to British Columbia (Anderson *et al.* 1990; Ireland *et al.* 1987). Grout (1935) discussed *E. fascicularis* under *E. leibergii*.

Description

The following description has been derived principally from Grout (1935), Lawton (1971), and Smith (1989), and from examination of specimens. Figure 1 illustrates many of the characters described here.

Entosthodon fascicularis is a small, 2-4(-7) mm tall, acrocarpous (producing female structures and sporophytes at the tips of the main stems) species that grows in small patches on seasonally wet soil. Mature plants are pale green to yellow-green. Mature leaves are crowded at the summit of the stem and range in length from 1.5-4(-5) mm, and range from 1-2 mm in width. Leaves are oblong-lanceolate to ovate-lanceolate, acuminate to acute, erect-spreading when moist, and often contorted when dry. The leaf margins of *E. fascicularis* are plane below, and often weakly toothed above, and the cells along the margin are usually somewhat longer and narrower than the adjacent medial cells. The irregularly rectangular and smooth upper leaf cells are thin-walled and range is size from 50-70 µm long to 15-25 (up to 40) µm wide. Its basal cells are elongate-rectangular, with, occasionally, inflated cells present forming auricles, or ear-

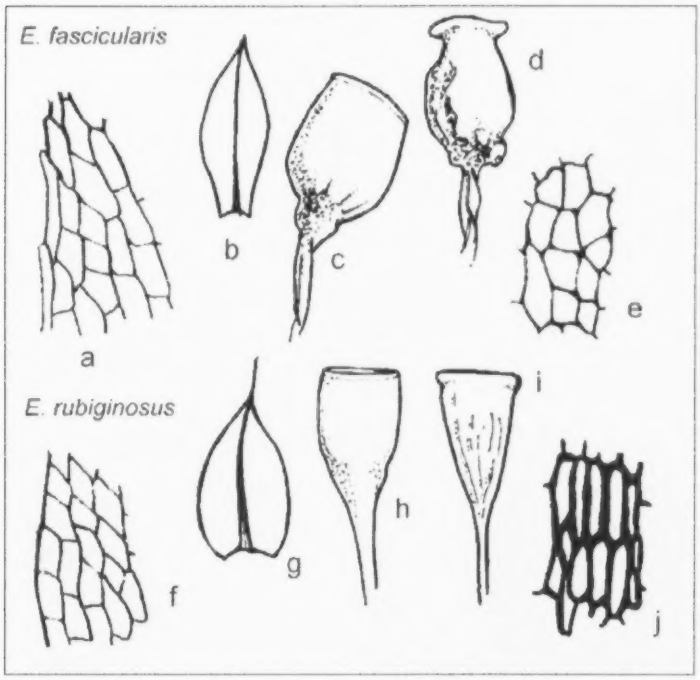

*Figure 1. Comparison of *Entosthodon fascicularis* (a – e) and *E. rubiginosus* (f – j); a, f: upper leaf margins (X 175); b, g: stem leaves (a: X12, b: X16); c, h: fresh capsules (c: X12, h: X16); d, i: dry capsules (d: X12, i: X16); e, j: upper cells of capsule walls (X 175); a, b, and f modified from Lawton, 1971, all others by T. McIntosh.

*Disclaimer: the original size of the drawing may not be reproduced accurately in the figure. The scales provided should be used only as indicators of relative size. Actual length measurements are given in the text.

like lobes, at the leaf base. The costa, or midrib, usually ends below or in the leaf apex, although, rarely, it may be slightly excurrent.

Entosthodon fascicularis is autoicous, with male and female organs on the same stem. The sporophytes are small, 5-9(-12) mm tall and mature in late winter and into spring. It has relatively large, distinct calyptrae (vegetative hoods that protect the young sporophyte), and they completely cover the maturing capsules. The calyptrae have long thin tips and are split near the base (see Cover Photo).. The sporophytes have globose-pyriform capsules that are erect and red- to yellow-brown when mature, and often distinctly contracted below the mouth and wrinkled at the base when dry. The mouth of the capsule is bordered by a series of small transverse-rectangular cells below which are cells that are irregularly quadrate and slightly thickened (this character separates it from the similar *E. rubiginosus*, which has elongate and usually thicker-walled cells below the upper border). The operculum, or lid, at the top of the capsule is convex, and when it drops it reveals a rudimentary peristome, although the peristome is sometimes absent. The spores are papillose, or rough, and range in size from 22-30 µm.

Taxonomic keys and additional illustrations are found in Grout (1935), Lawton (1971), and Smith (1989, as *Funaria fascicularis*).

DISTRIBUTION

Global range

Entosthodon fascicularis has a western North American–western Eurasian disjunctive pattern. It is relatively rare in North America, found only in British Columbia, Washington, Idaho, and Oregon (Fig. 2; Grout 1935, Lawton 1971). NatureServe Explorer (2002) does not list it for Idaho, but does list it for the other locations. It is more common in Europe, found in Sweden, Denmark, Britain, and Ireland (Smith 1989, NatureServe Explorer 2002), and, possibly, the Middle East (Kürschner 2000).

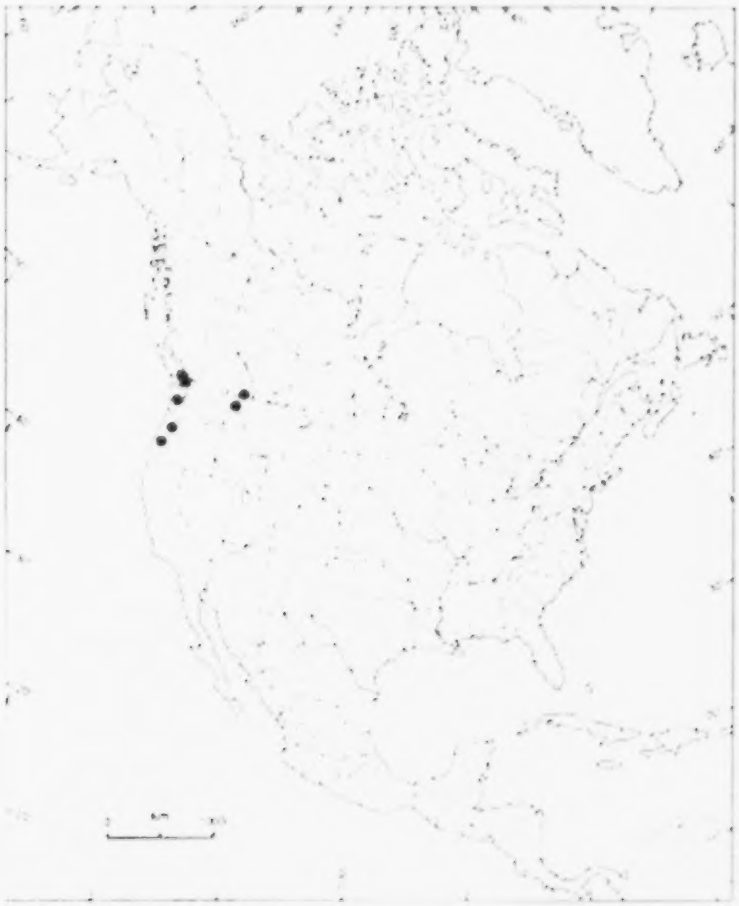

Figure 2. North American distribution of *Entosthodon fascicularis*.

Canadian range

In Canada, the banded cord-moss is restricted mainly to a small coastal area in southwestern British Columbia, with a lone collection from southeastern British Columbia (Fig. 3). Along the coast, it has been found at twelve sites on southeastern Vancouver Island, and once on each of three nearby islands: Trial Island near Victoria, Saturna Island, east of Victoria, and Hornby Island (Sadler 2005; Table 1).

Figure 3. Canadian distribution of *Entosthodon fascicularis* (dots may represent more than one location, see Table 1 for details).

Table 1. Population Information for *Entosthodon fascicularis* (numbers in brackets following the population number refer to Collections Examined; collections 3 and 9 are the same location in Uplands Park, whereas exact locations of the Nanoose Hill collections are uncertain, and may be from different sites in the area and may represent separate populations).

Population #	Location	Dates visited	Dates confirmed
1 (1)	Malahat, N. of Victoria	1982/2002	No (2002)
2 (2)	Eagle Heights, near Duncan	1999/2002	No (2002)
3 (3, 9)	Uplands Park, Victoria	1982/2001/2002	Yes (2002 by Wynne Miles and T. McIntosh)
4 (4, 5, 6, 7)	Nanoose Hill, near Nanaimo	1969/1975/1976/ 1993/2002	No (2002)
5 (8)	Victoria (King's Pond)	1961/2002	Yes (2002 by Wynne Miles and T. McIntosh)
6 (10)	Trial Island, near Victoria	1982/2000	not visited in 2002 - 2004
7 (11)	Old Baldy Mountain, near Duncan	1970/2002	No (2002)
8 (12)	Sooke	1969	No (2002)
9 (13)	Saturna Island	1997	not visited in 2002- 2004
10 (14)	Yahk Park, Kootenay area	1978	not visited in 2002 - 2004
11	Christmas Hill, Victoria	May 13, 2004	Yes (by A. and O. Ceska)
12	Skirt Mountain, Victoria	March 21, 2004	Yes (by A. and O. Ceska)
13	Harmac, near Nanaimo	April 8, 2004	Yes (by A. and O. Ceska)
14 (15)	Observatory Hill, Victoria	March 16, 2004	Yes (by T. McIntosh, W. Miles and A. and O. Ceska)
15	Helliwell Provincial Park, Hornby Island	2003	Yes (by K. Sadler)

Only two of the reported populations were located during initial fieldwork for this report in 2002: the Uplands Park and the King's Pond populations in Victoria (Populations 3 and 5, respectively). Other sites that were searched where it had been collected in the past were along the Malahat highway, Eagle Heights, and Nanoose Hill. The general location (Vancouver Island, Victoria) on the herbarium packet of Population 5 was clarified as King's Pond by the original collector, W.F. Savale. However, field work was initiated in the summer of 2002, which was possibly too late for this species. The banded cord-moss grows in late winter, matures in spring, and may decompose or be covered by litter by summer, although sporophytes of the Uplands Park population were found in late August. It has also been very dry over the past few years, and sporophytes may not have been produced as frequently as in the past. Further, this species may be overlooked because of its diminutive size and its habit of growing as small, highly localized patches, sometimes hidden amongst other mosses and litter. Much of the locality information on the herbarium collection packets is not very specific and, since many of the localities have abundant potential habitat and this species is locally rare, the exact location of individual populations may have been missed.

In the spring of 2003, T. McIntosh, along with W. Miles, initiated a study of rare and interesting bryophytes in Garry oak ecosystems in coastal British Columbia (McIntosh and Miles 2005). Many open sites, including habitats characteristic of *Entosthodon fascicularis*, were examined across much of the range of Garry oak. In addition and

mostly separate from that survey, A. and O. Ceska also searched for this species in 2004. Sites on Salt Spring Island, near Nanaimo, in the Duncan area, and around Victoria were investigated. Altogether, approximately 60 sites have been investigated by these investigators and *E. fascicularis* was found only four additional times (Populations 11 to 14). One additional recent site (Population 15) was found in Helliwell Provincial Park in 2003.

HABITAT

Habitat requirements

Entosthodon fascicularis usually grows on soil, sometimes amongst litter and other mosses, in open to shaded habitats, usually in or near vernally moist sites, often near rock outcrops. Grout (1935) stated the habitat as: 'wet springy places...alt. 2100 ft.' Lawton lists the habitat as on soil to 700 metres. Information from herbarium packets of British Columbian collections varies from "on dampish earth (on an) open outcrop" and "on moist earth of outcrop slope" to "hard packed earth near trail" or "earth of slope under *Quercus*" (see Collections Examined for more details on general habitat). The most detailed provincial information is from Collection Examined #3: "In large vernal pool. On open ground with *Psilocarphus elatior, Juncus bufonius, Plantago bigelovii, Anagalis minima, Centaurium muhlenbergii*, etc. Elevation: ca. 30m."

Fifteen of the sixteen Canadian populations of *Entosthodon fascicularis* are found within the range of the nationally threatened Garry oak ecosystem. Ten populations are found in Garry oak habitats (Populations 2, 3, 4, 5, 6, 9, 11, 13, 14, and 15). Although three sites (Populations 1,7, and 12) are in open areas surrounded by very dry Douglas-fir forest, they are considered to be within the framework of Garry oak associations as outlined in the developing provincial community classification system. The remaining outlier site is in a dry pine/fir forest in the Kootenay Region.

Trends

The habitats at most sites where *Entosthodon fascicularis* occur appear to be undisturbed, although Populations 3 and 5 are somewhat disturbed. The King's Pond site is adjacent to a golf course and there is a great amount of disturbance by ducks and Canada geese around the margins of the pond when water levels are low. The specific location where the moss was found, however, did not appear to be significantly disturbed. The population at the Uplands Park site grows in a rather large low area that is wet for much of the winter. During the drier months walkers and their dogs frequently use the park.

Protection/ownership

Ownership of some of the reported populations is undetermined (Table 2). Populations 2, 3, 11, and 15, and probably 4 and 6, are in municipal or provincial parks

and are generally protected from large-scale disturbances, but not from hiking disturbances. Population 14 is within a protected area near a federal observatory. Population 9 on Saturna Island may lie within the new Southern Gulf Islands National Park Reserve.

BIOLOGY

General

Entosthodon fascicularis is a small, erect-growing moss that grows in patches on seasonally wet soil amongst other mosses and vascular plants.

Reproduction and dispersal

The production of sporophytes by *Entosthodon fascicularis* is common in Canadian populations and spores are probably of importance in the short-range dispersal of this species, especially into open areas. Although usually considered short-lived, *Entosthodon fascicularis* may be perennial or pauciperennial (short-lived perennial) in nature (personal observations by T. McIntosh and by O. Ceska). W. Miles collected mature plants and a small amount of soil, litter, and associated plants from the Uplands site in early 2003. These were sent to T. McIntosh who kept the plants alive into 2004, during which time some of the same plants completed one life cycle. Many small buds are found on underground stems and may persist from year to year, but this aspect of their life history needs further research.

POPULATION SIZES AND TRENDS

At all sites where it was found during this survey, *Entosthodon fascicularis* is rare and represented by one or a few small patches, each of which was considered an individual, following guidelines in Hallingbäck *et al.* (1998). Population trends cannot be determined until monitoring is undertaken.

LIMITING FACTORS AND THREATS

Limiting factors and threats to the habitats of *Entosthodon fascicularis* may include urban or highway development, hiking, wildfowl grazing, and usage of some areas by dogs (Table 2). However, most of the reported populations are in relatively protected or isolated areas or microsites that are probably not impacted much by the majority of these factors. However, Population 13, near Harmac, is in an area destined for future development. The last four to five years have been particularly dry in Garry oak habitats of coastal British Columbia where many of the populations are found, and some of the populations may have declined because of this drought, possibly related to climate change.

Table 2. Habitat and General Characteristics of Known Populations of *Entosthodon fascicularis* in British Columbia (from Table 1).

Population	Limiting Factors and Threats	Habitat Condition and Trend	Population Size and Trend	Protection and Ownership
1	?A	?	?	?BC Highways
2	?B	?	?	Provincial Park
3	B, D	F, H	M, ?	Municipal Park
4	?A, B, D	?	?	probably a park
5	C, D	F-G, J	M, ?	Private Golf Course
6	?	?	?	Protected area on Federal Land
7	?	?	?	?
8	?	?	?	?
9	?	?	?	possibly within the new Southern Gulf Islands National Park (Federal Land)
10	?	?	?	?
11	?	?	M (one small patch)	Municipal Park
12	A	?	M (a few small patches)	Private (under transmission power lines)
13	A	?	M	Private (Weyerhauser)
14	none	?	M	Federal protected area near observatory
15	?	?	?	Provincial Park

Notes (in all cases, '?' refers to 'unknown' or 'uncertain'

1. With respect to column for **Limiting Factors and Threats**: A refers to urban or highway development, B refers to hiking, C refers to wildfowl grazing, and D refers to usage of areas by dogs.
2. With respect to column for **Habitat Condition and Trend**: *Habitat Condition*: E refers to relatively undisturbed, F refers to moderately disturbed, G refers to heavily disturbed. *Habitat Trend*: H refers to possibly improving, I refers to possibly stable, J refers to possibly degrading.
3. With respect to column for **Population Size and Trend**: *Population Size*: K means widespread in area surveyed, L means uncommon across site, and M rare across site. *Population Trend*: N may be improving, O may be stable, P may be degrading.
4. With respect to column for **Protection and Ownership**: text in table describes ownership.

SPECIAL SIGNIFICANCE OF THE SPECIES

The British Columbia populations represent the northern extension of its very restricted range in North America. Most of the populations for this species are in Canada. This species is often found in seasonally wet habitats in Garry oak ecosystems, such as vernal pools and seepage areas on rock outcrops. These habitats are considered threatened and rare in British Columbia and Canada, and often house a number of rare species in addition to this moss.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

No legislation, regulations, customs, or conditions protect Canadian populations of *Entosthodon fascicularis*. In British Columbia, the BC Species and Ecosystem Explorer (2003) lists this species as Red-listed provincially (S2, referring to any indigenous species or subspecies that have, or are candidates for, Extirpated, Endangered, or Threatened status). In Oregon, it is ranked S1 (critically imperiled in Oregon), with 2 records (J. Christy pers. comm. 2002). NatureServe Explorer (2002) ranks this species as G4G5.

SUMMARY OF STATUS REPORT

The banded cord-moss is a small species that typically grows in seasonally wet habitats on soil amongst other mosses. Although this species is often reported as an annual, it may, in fact, be perennial or pauciperennial. In Canada, *Entosthodon fascicularis* has been reported at 15 sites in British Columbia, with most of the sites along the south-central coast of the province, and one population in the Kootenay Region in eastern British Columbia. Only two of the known sites were confirmed in recent surveys, although five new sites are reported here. The species may be more common in available habitat than records suggest, but its short season of appearance as small populations make confirmation of this difficult. The Canadian populations are the northernmost locations for a species that has a very restricted distribution in North America.

TECHNICAL SUMMARY

Entosthodon fascicularis
Banded Cord-moss entosthodon fasciculé
Area of Occurrence in Canada: BC

Extent and Area information	
• *extent of occurrence (EO)(km²)*	< 800 km²
• *specify trend (decline, stable, increasing, unknown)*	unknown
• *are there extreme fluctuations in EO (>1 order of magnitude)?*	no
• *area of occupancy (AO) (km²)*	<1 km²
• *specify trend (decline, stable, increasing, unknown)*	unknown
• *are there extreme fluctuations in AO (>1 order magnitude)?*	unknown
• *number of extant locations*	15 recent sites (since 1969)
• *specify trend in # locations (decline, stable, increasing, unknown)*	Not known
• *are there extreme fluctuations in # locations (>1 order of magnitude)?*	No
• *habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat*	Stable to declining (e.g., Garry oak habitats)
Population information	
• *generation time (average age of parents in the population) (indicate years, months, days, etc.)*	unknown, but species may be a short-lived annual/biennual most visible for short periods in spring and early summer when capsules are present
• *number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values)*	unknown
• *total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals*	unknown
• *if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)*	unknown
• *are there extreme fluctuations in number of mature individuals (>1 order of magnitude)?*	unknown
• *is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., ≤ 1 successful migrant / year)?*	no
• *list each population and the number of mature individuals in each*	unknown
• *specify trend in number of populations (decline, stable, increasing, unknown)*	unknown
• *are there extreme fluctuations in number of populations (>1 order of magnitude)?*	unknown
Threats (actual or imminent threats to populations or habitats)	
Disturbance from recreational activities Urban development Climate change	

Rescue Effect (immigration from an outside source)	
• *does species exist elsewhere (in Canada or outside)?*	yes - USA
• *status of the outside population(s)?*	globally secure, but listed S1 in Oregon
• *is immigration known or possible?*	unknown
• *would immigrants be adapted to survive here?*	evidently
• *is there sufficient habitat for immigrants here?*	evidently

Status and Reasons for Designation

Status: Special Concern	**Alpha-numeric code**: Not applicable

Reasons for Designation:

This rare species is endemic to western North America. Almost all Canadian populations of this moss occur in the threatened Garry Oak habitat of southwestern British Columbia. Should habitat destruction continue at the present rate, the species will become increasingly vulnerable.

Applicability of Criteria

Criterion A (Declining Total Population): Data are not available.

Criterion B (Small Distribution, and Decline or Fluctuation): Area of occupancy is less than 500 km^2; however, the species exists at 15 sites and is not severely fragmented.

Criterion C (Small Total Population Size and Decline): Data are not available on number of individuals.

Criterion D (Very Small Population or Restricted Distribution): Data are not available on number of individuals.

Criterion E (Quantitative Analysis): Not applicable.

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Dr. Terry McIntosh completed his Ph.D. in 1985 following a study of grassland and shrub-steppe bryophytes in the interior portions of British Columbia. Since then, he has been active collecting bryophytes from many parts of the province and in dryland areas of adjacent Washington State. He has been a primary identifier of bryophyte collections from various government and private surveys in the province. He has recently prepared sixteen rare species accounts on bryophytes for the Wildlife Branch of the Province of British Columbia and two COSEWIC Status Reports on mosses.

COLLECTIONS EXAMINED

Collections numbers 1 to 14 are at UBC; number 15 will be deposited into the UBC Herbarium.

1.

Entosthodon fascicularis (Hedw.) C. Müll.

Accession number:	B28822
Location:	Vancouver Island: Outcrop knobs summit of Malahat Highway
Habitat:	On dampish earth, open outcrop.
Collector:	W. B. Schofield
Collection number:	77535
Collection date:	29 April 1982
Determiner:	W.B. Schofield
Notes:	cfr. / + *Riccia sorocarpa*

2.

Entosthodon fascicularis (Hedw.) C. Müll.
Accession number: B175064
Location: Vancouver Island: Koksilah River Provincial Park area
Habitat: On moist earth of outcrop slope.
Collector: W.B. Schofield
Collection number: 112183
Collection date: 14 May 1999
Determiner: W.B. Schofield
Notes: cfr.

3.

Entosthodon fascicularis (Hedw.) C. Müll.
Accession number: B177595
Location: Vancouver Island: Uplands Park, Victoria.
Habitat: In large vernal pool. On open ground with *Psilocarphus elatior, Juncus bufonius, Plantago bigelovii, Anagalis minima, Centaurium muhlenbergii*, etc. Elevation: ca. 30m.
Collector: A. Ceska with O. Ceska.
Collection number: s.n.
Collection date: 8 July 2001
Determiner: W.B. Schofield.
Notes: -

4.

Entosthodon fascicularis (Hedw.) C. Müll.
Accession number: B140200
Location: Vancouver Island: Nanoose Hill.
Habitat Hard packed earth near trail.
Collector: W. B. Schofield
Collection number: 98661
Collection date: 4 May 1993
Determiner: W.B. Schofield
Notes: C.fr.

5.

Entosthodon fascicularis (Hedw.) C. Müll.
Accession number: B151190
Location: Vancouver Island: Nanoose Hill.
Habitat: Earth of slope under *Quercus*.
Collector: W.B. Schofield
Collection number: 60430
Collection date: 5 May 1976
Determiner: W.B. Schofield
Notes: C.fr.

6.

Entosthodon fascicularis (Hedw.) C. Müll.

Accession number:	B151189
Location:	Vancouver Island: Nanoose Bay, Nanoose Hill.
Habitat:	Earth of terrace in open slope.
Collector:	W.B. Schofield & Botany 500 class.
Collection number:	57692
Collection date:	5 May 1975.
Determiner:	W.B. Schofield
Notes:	C.fr.

7.

Entosthodon fascicularis (Hedw.) C. Müll.

Accession number:	B151192
Location:	Vancouver Island: Hillside just North of Nanoose bay.
Habitat:	Dry slope with open stands of Garry Oak and *Arbutus*. Hard packed open soil on slope.
Collector:	R. Halbert with W.B. Schofield and N. Price
Collection number:	1680
Collection date:	13 May 1969
Determiner:	R. Halbert
Notes:	C.fr

8.

Entosthodon? fasicularis

Accession number:	B151194
Location:	Vancouver Island: Victoria
Habitat:	On rich soil in oak woodland.
Collector:	W.F. Savale
Collection number:	70 A
Collection date:	May 1961
Determiner:	W.F. Savale
Notes:	C.fr. Leaves markedly serrate, capsule pyriform, curving to mouth, calyptra completely investing capsule. Spores warty papillose, ca. 30 u diam. Rudiments of inner peristome present.

9.

Entosthodon fascicularis (Hedw.) C. Müll.

Accession number:	B28639
Location:	Vancouver Island: Uplands Park, Victoria.
Habitat:	Shaded peaty depressions near edge of seepage area.
Collector:	W.B. Schofield with A. Ceska and O. Ceska.
Collection number:	77253
Collection date:	6 April 1982.
Determiner:	O. Lee (1983)
Notes:	C.fr.

10.
Entosthodon fascicularis (Hedw.) C. Müll.
Accession number: B32812
Location: Vancouver Island: Trial Island, South of Victoria.
Habitat: Damp humus near seepage area.
Collector: W.B. Schofield
Collection number: 77445
Collection date: 1 April 1982
Determiner: W. B. Schofield
Notes: C.fr.

11.
Entosthodon fascicularis (Hedw.) C. Müll.
Accession number: B151191
Location: Vancouver Island: Old Baldy Mountain. On shore of Shawinigan Lake.
Habitat: On rich earth of terrace on mountain side.
Collector: R.L. Halbert
Collection number: 4456
Collection date: 12 May 1970
Determiner: R.L. Halbert
Notes: C.fr.

12.
Entosthodon fascicularis (Hedw.) C. Müll.
Accession number: B151193
Location: Vancouver Island: Sooke Harbor
Habitat: Hard packed soil in uncultivated field.
Collector: R. Halbert with N. Price
Collection number: 1935C
Collection date: 21 May 1969
Determiner: R. Halbert
Notes: C.fr.

13.
Entosthodon fascicularis (Hedw.) C. Müll.
Accession number: B165304
Location: Saturna Island: Mt. Warburton Pike.
Habitat: Earth hummock, edge of seepage outcrop.
Collector: W.B. Schofield
Collection number: 107806
Collection date: 21 May 1997
Determiner: W.B. Schofield
Notes: C.fr.

14.

Entosthodon fascicularis (Hedw.) C. Müll.

Accession number:	B4324
Location:	South of Yahk Park, Kootenay.
Habitat:	Dry creek bank in Douglas fir-*Pinus contorta* forest. On soil.
Collector:	B.C. Tan with C. Teng
Collection number:	78-1273
Collection date:	27 August 1978
Determiner:	B.C. Tan
Notes:	fertile

15.

Entosthodon fascicularis (Hedw.) C. Müll.

Accession number:	
Location:	Observatory Hill, Victoria.
Habitat:	On soil over shaded ledge .
Collectors:	W. Miles, T. McIntosh, and A. and O. Ceska
Collection number:	Miles 64-2004
Collection date:	March 16, 2004
Determiner:	T. McIntosh, O. Ceska, and A. Ceska
Notes:	fertile; rare, one small 10 X 5 cm. patch

Appendix 1. Record of work

In 2002, field work investigating known collection sites for *Entosthodon fascicularis* and potential new sites was undertaken between July 18 and 21 on Salt Spring Island, near Nanaimo, and at Eagle Heights in the Duncan area, and on October 1 and 2 and November 6 in the Victoria area. In 2003, on January 25 and 26, W. Miles investigated and found young plants of this species at the Uplands site in Victoria. Numerous sites were examined for this species since that time during an ongoing rare bryophyte research project. Approximately 60 sites have been investigated for this moss altogether.